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ABSTRACT

This discussion of the potential role of telecommunications in rural development begins by identifying education, culture and recreation, social pursuits, information exchange, political activity, community development, and business opportunities as activities that might be benefitted by the use of telecommunications. The capabilities and applications of computer conferencing and the complex technologies such as communications satellites that are needed to be able to offer such services are then considered, as well as applications of remote sensing and telemetry systems of interest in the context of rural telecommunications. The Grassroots project, which brought telecommunications services to rural areas of Manitoba, is used as an example. (MES)

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REDUCING ISOLATION: TELECOMMUNICATIONS AND RURAL DEVELOPMENT

John B. Black

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Reducing Isolation:

Telecommunications and Rural Development

The Sixth Arkleton Lecture

By

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October 6, 1986

REDUCING ISOLATION: TELECOMMUNICATIONS AND RURAL DEVELOPMENT

For better or for worse, the day of the electronic croft has arrived, although perhaps not in the way Toffler originally had in mind when he wrote of the "electronic cottage". At the same time the global village has also become very much a reality, even if a far cry from what McLuhan had originally contemplated. The cornucopia of telecommunications technologies available today have combined to create a very different communications environment from that existing only a few years ago. We have already seen many effects springing from these developments, although in reality, we are only at the beginning of a process which has the potential for radically altering what we normally think of as rural life.

I will not resort to the academic's classic ploy of starting a presentation by defining, at considerable length, all the terms to be used in his text. Instead, I will simply assume a common usage view of what constitutes "telecommunications" and "rural". Throughout history one of the most basic characteristics of what has come to be commonly termed "rural life" has been isolation, to one degree or another. Physical isolation from one another in local settings, from nearby communities and from the "outside world". For some this has been one of the great advantages and attractions of rural life, but for many others, consciously or unconsciously, it has been a major drawback and a stimulus to migration to urban areas. For most rural people this isolation has not been something they have thought about at great length, rather it has simply been a fact of life. From their perspective, that is the way life is, or at least the way it has been up to now.

For better or for worse, the telecommunications technologies available as we approach the last decade of the twentieth century provide a means of breaking down this rural isolation dramatically. In one way or another, this has been happening since the invention of the telegraph in the early nineteenth century, but during the past few years the pace of such change has become incredibly fast and the extent of the impact has increased by orders of magnitude.

Telecommunications technologies and services are certainly part of the "information age" which is very much with us. What many observers describe as the "information based economy" has many implications for all of us and rural communities will not (and should not) be isolated from these changes in the rest of society. One might argue that perhaps rural life will be less affected by these tendencies than many other sectors of society, but that is a patronizing and self limiting argument. I feel that it is essential to remember that most rural people have the same telecommunications needs and demands as urban dwellers. In some cases these needs may be even greater due to the physical isolation. Regardless, the question is not whether telecommunications technologies will change rural life, but, rather, what the degree and form of the impact of this change will be.

In this lecture I am concentrating on only one aspect of what has perhaps become too casually known as the "information revolution": <u>telecommunications</u>. Because of the possibility for contemporary telecommunications technologies (and various related supporting technologies) to bridge time and distance in dramatic new ways, it is particularly important that their potential role in the process of rural development be recognized and exploited positively. In particular, telecommunications technologies can be used on a selective and individually controlled basis to allow broad, active participation in such activities as:

* education
* culture and recreation
* social pursuits
* information exchange
* political activity
* community development
* business, commercial, employment opportunities.

The technological context being used refers to two broad areas areas: telecommunications technologies per se and the services provided via these technologies.

In very simplistic terms one can separate the "technologies" by the transmission media involved:

* surface based, hard physical links
  - copper wire
  - fibre optics
  - coaxial cable

* radio frequency based
  - LW - MW - SW - VHF - UHF - SHF radio services
  - television
  - cellular radio
  - microwave systems
  - communications satellites.

"Services" include a vast range of possibilities which are increasingly available to all regions and types of communities. Normally, most people think of telecommunications technologies as the telephone, telegraph and perhaps broadcasting, but today they must be viewed in the context of a much wider range of options including,

* telephone
* telegraph
* telex
* broadcasting (radio and TV plus shortwave radio)
* videotex

* teletext
* teletex
* facsimile
* electronic messaging
* computer conferencing
* electronic publishing
* data
* video
* paging and remote locator services
* remote sensing
* telemetry.

In addition, these services must also be viewed in the context of other "information technology" developments such as personal computers, floppy disks, CD-ROMs, laser video-disks, desktop publishing, laser printers, etc. The old distinctions between what constitutes computing, storage, distribution and communications technologies have, to an increasing degree, become blurred.

In essence, today there is the realistic technical potential of bringing ALL of these services to ANY rural setting, admittedly at a cost. In an obvious oversimplification, "all" that is necessary is that the need / demand be present and the resources be available to support their introduction and operation. Rather than looking at the technologies and services per se in detail and individually, it is probably more useful, in the context of this lecture and the work of the Arkleton Trust, to look at a few of the more interesting applications of these technologies that one can see today.

In what will come as absolutely no surprise to those reading this lecture text who know me, I will begin by focussing on computer based messaging systems and, in particular, on what has come to be termed "computer conferencing". Realizable through the conjunction of the development of increasingly lower cost

data transmission services, computing facilities and access devices (be they "dumb" terminals or microcomputers), this particular telecommunications application provides a means of bridging time and distance to facilitate interpersonal, human communication in a fashion which has heretofore been impossible. The basic concept of computer conferencing is perhaps all the more powerful and appealing because of its simplicity: in essence computer conferencing presents the opportunity for however many people have the need or desire to communicate about a particular subject (or many subjects) to do so without being either physically present in the same location (as in a conventional meeting) or even available at the same time (as in a telephone conference call or a video tele-conference). Through the use of data access links (which may be a simple, ordinary telephone call or may be an international packet-switched data network link), a computer to act as "host" for the discussion and only a very simple terminal device, all those who wish (or need) to participate in such a discussion may do so, each at their own convenience, on their own time schedule and from their choice of location. The computer conferencing software on the "host" machine keeps track of all the interactions in the discussion and creates what is, in effect, an open ended data base of the contributions by the participants. When each person signs on to the system they are presented with the new material that has been added to the various discussions of which they are a participant and they may then in turn comment on these messages, add new thoughts or begin a whole new aspect of the discussion. In the process this "data base" becomes an instant transcript of this "virtual meeting" which is taking place electronically.

The direct application of this very powerful facility, as in the case of so many of the "new technologies" available today, is largely limited by our own imaginations. The term "computer conferencing" itself is a good illustration of this for it demon-

strates only too clearly how we tend to try to fit something new into familiar terminology (in this case "computers" and "conferences") and in the process cause no end of confusion. I have seen this tool used for a wide range of applications including,

* scientific and technical information exchange
* collaborative research and writing
* distance education
* continuing education (esp. in professional groups)
* project management
* administrative communications
* organizational communications
* common interest groups
* emergency and disaster communications.
* recreation (in essence, chatting)

The potential for using this kind of system in rural areas is obvious and the realistic possibility of it being available is increasing as the telecommunications infrastructure improves in rural areas. The RURTEL project being planned by the Arkleton Trust for the highlands and islands of Scotland is an excellent example of the appropriateness of this tool in a rural setting. Growing up on a beef cattle farm in Southern Ontario I know that I would have sold my soul to the devil (figuratively speaking) to have had access to something like this thirty years ago. I recall the excellent work done by the Farm Radio Forum radio programs of my childhood and their impact on Canadian rural life, but I also realize how much more useful these broadcasts and local discussions would have been with something like computer conferencing available to provide an ongoing, continuous and distance independent support to the activity.

To be able tc offer a service like computer conferencing to rural communities requires the presence of an increasingly complex set of telecommunications technologies, many of them offering what are sometimes

described as "thin-route" telecommunications services. One of the most important developments in the past decade (and most symbolic of the age) is communications satellites, especially the development of "distribution satellites" and "direct broadcast satellites". It is only forty years since the young British Post Office engineer Arthur C. Clarke first described how three "microwave relay stations" placed in a particular orbit above the earth could provide world-wide telecommunications coverage. Twenty years was to pass before his concept was realized, and today we accept these facilities as the norm. Two weeks before giving this lecture I sat in a small classroom in Bandung, West Java, Indonesia, and spent two hours linked to a computer in Guelph via a landline to Jakarta, an INTELSAT link to the United States, through one of the U.S. "International Record Carriers", into Tymnet (a US packet switched network), back into DATAPAC (a Canadian public packet switched data network) and then to the computer in Guelph. Less than five seconds was required to make the initial link contact and then two hours of solid use without as much as a character distorted by a transmission error. We tend to take it all for granted!

Rural Canadians increasingly assume access to satellite communications (especially in the form of television broadcasting) as part of their basic "rights" and anyone who feels that rural areas do not want access to the same telecommunications services as people in urban / suburban areas should listen to some of the arguments that flow when the Canadian regulatory authority threatens to restrict access to the channels that can be carried on local cable television systems, tries to eliminate a pirate local re-broadcaster who is illegally picking up distant television signals or talks of restrictions on personal TVRO systems (the giant "woks" scattered with increasing frequency around the North American countryside). But, I digress.

These same satellite systems can do far more than deliver "Dallas" and California wrestling to rural and remote residents of Canada and the United States (plus much of the Caribbean where the antennae appear almost as frequently only they are bigger). Technically, they have the potential to deliver virtually any telecommunications service to rural and remote areas where provision of terrestrial links (lines or microwave) are not viable due to distance, terrain, low density, or a host of other factors. For example, the British Columbia forest service uses 2.4 metre satellite antenna systems to provide a large number of remote (and changing) firefighting sites with a full range of telephone services (including a Vancouver number for incoming calls and all the usual services available to any urban B.C. dweller). Other portable satellite groundstation systems are in use throughout northern Canada where the telecommunications infrastructure was practically non-existent in the pre-satellite era, but today the full facilities of modern telephone based services are commonplace. Even TVRO systems that are currently being used solely for television reception already have other signals on the same transponders (data, sub-carrier channels with music and other specialized services) and in the future could be used as vehicles for mass distribution of educational materials, information services, and computer software during non-broadcast hours.

The "satellite business" is going through some interesting transitions at the present time due to a number of factors. These include an excess of transponder capacity already in orbit (although not always in the "right" place), a major threat to its high traffic (and high profit) routes from the new submarine and land based high capacity fibre optic links that are just being put into place and commissioned (the capacity of the INTELSAT trans-Atlantic satellites, for example, is dwarfed by even a single submarine fibre optic link -- a link that is faster and more secure)

and some degree of hesitancy and confusion in how / where / when "direct broadcast satellite" services will be put into full operation. In many parts of the world, it is this last type of satellite system, which uses a relatively high powered satellite transponder and a small, low power ground station, that holds the most promise for cheap, mobile, reliable and broadly accessible rural telecommunications services.

Satellite systems, nonetheless, still require a certain scale of enterprise, probably government involvement and a significant level of technical sophistication to put into place. It is, therefore, also interesting to look at a development that is much simpler, lower cost and, potentially, exploitable on a local level to help provide elements of the infrastructure necessary to give access to such services as information networks and computer conferencing. "Packet radio" is an application of the same basic concepts underlying the "packet switched data networks" that have become the backbone of national and international data transfer and communications networks. Originally developed by amateur radio operators (initially largely in Canada), packet radio systems provide a means of creating data networks where each site operates a local "node" that is linked to other sites by VHF radio transceivers with a range of up to 50 km (depending on terrain). A number of different sites can communicate among themselves sharing the same radio frequency at the same time. Some of these sites, in turn, may provide gateways to other such networks or access to other "repeater stations". Today this technology is being used by amateur radio operators to expand their own technical horizons and to engage in the basic communications activities that have interested them for decades. But, this same equipment (and some modified packet nodes that will operate with High Frequency [HF] transceivers over much longer distances) could also be used to provide very low cost data links in many remote areas. Packet radio equipped high-

landers using a computer conferencing system (like RURTEL) to plan community activities, take an open university course or simply keep in touch on a wet December night? Not an unrealistic prospect.

Although most of my comments so far have centred on human communication, one other aspect of telecommunications technology of particular relevance to rural areas to which I would like at least to allude is the development of remote sensing and telemetry systems. These may strike some as being too close to Orwell's 1984, but to take that tack would be to close our eyes to the tremendous potential of positive benefit from these systems. Some contact and experience with such systems is becoming increasingly widespread, even though the applications may not have been viewed in the context of this lecture. Of particular interest in the context of rural telecommunications are such applications as,

* weather maps from satellites
* land use maps
* moisture content information from field sensors
* crop and land condition information from LANDSAT
* river, stream and flood control information
* electric power control systems
* wide area paging systems
* emergency locator systems (eg. for aircraft and ships)
* personal emergency communications (eg. medical alerts).

Current research and development activities take one far beyond these systems, however, and link into computer systems that can provide types of data and information previously unavailable. For example, one group I am aware of is working on a combination of remote sensors on a harvesting machine, radio transmisson of data from that machine to a computer running an "expert systems" program that will in turn add to a

"data base" of information about the land over which the machine is moving that then will be used the following year to control, via a radio link, the planting machine running over the same ground to ensure that the right combination of seed spacing and fertilizer are used at any particular point in the field. A complex example, but an indication of one relatively "simple" new telemetry application. "High tech", yes, but with a very down to earth orientation.

One should not discuss this subject without reference to the Grassroots project, a noble attempt to bring access to information and modern telecommunications services to the rural areas of Manitoba via a Telidon based videotex system. Using alphageometric videotex pages providing colour, text and graphics, Grassroots included a wide range of services and information such as,

* electronic mail
* electronic banking
* teleshopping
* news
* weather
* crop data
* consumer information
* educational materials
* transportation schedules (airlines, trains etc.)
* special interest groups.

This service was later extended to a field trial in Ontario with additional information added specifically for Ontario farmers. To treat the Grassroots project with any fairness requires a lecture (or many) of its own. However, I do want to mention it here as perhaps a classic example of the problem of introducing such a service into any community, especially a rural one. In the context of this lecture I would like to suggest that it is apparent from this experience that to introduce new telecommunications and information systems

into any area, rural or urban, requires that people not only "need" the service, but that they also have the opportunity to become fully aware of what the system can do (an educational process), become comfortable with the technology and WANT to use it. The North American experience with videotex to date has lead some observers to describe it as a "solution in search of a problem", although I feel that is a far too simplistic assessment of the failure of a number of systems with great potential to fully realize that potential.

When one views all the telecommunications applications currently available to us and on the immediate horizon, it is apparent that we do have a wide range of opportunities for reducing isolation as a factor to adversely affect rural life today. In fact, I would suggest that we have the possibility of enabling those who live in rural communities to participate in and take advantage of many features of urban, metropolitan life without actually having to live there! No longer do rural residents need to be consigned to a "second class" status in terms of access to education, business / commercial opportunities, information services or cultural activities. Some may argue that rural residents would be "better off" without these "temptations", "outside influences" or "alien value systems". I can well understand this concern, but a failure to take positive (if selective) advantage of the opportunities presented by today's telecommunications technologies will indeed dramatically limit the development of these communities.

In most development situations (be it in the so-called "third" world or in the "first" or "second" world) telecommunications development has been generally closely linked to economic development which in turn tends to be focussed on urban areas. Even if the basic proposition that advancements in telecommunications are an essential condition for economic and

social development today is accepted there may or may not be a flow through of this acceptance to the actual development of rural telecommunications.

What I have outlined in this paper are real technical possibilities. Getting them into place is another matter. Complex economic, social, political and legal factors will certainly affect the use of these technologies and may in some cases present barriers to their successful implementation.

Nonetheless, it is certain that many opportunities are present as this "central nervous system" of society develops. The challenge facing all of us is to approach these opportunities with imagination and sensitivity.